

The TS2068 32K Non-Volatile Ram Kit

Thomas Bent

Background Information

This board has been designed with maximum utility in mind. It is possible to extend the memory of this product to 64K by adding one additional 32K Static Ram chip in the other socket.

This boards' predecessor used four 8K static ram chips to make up 32K. This was done by stacking the ram chips. Using this method, it is possible to add an additional 64K (a total of 128K in all) by adding only one diode and four jumper wires (and the extra ram chips) to the board. We'll discuss this later.

READ THIS FIRST!!!

Before you begin to build your kit, check to be sure that all of the necessary parts are in your kit. Look at the board. One side of the board has several black lines "painted" on it. This is the side that all soldering will be done on (solder side, bottom side or back side). The other side (component side) shall have all of the parts mounted on it.

Critical Items:

Battery Holder

74LS139

74LS122

1N5817 (or 1N5818) Schottky Diode

MREQ Decoupling Capacitor

Each of these items must be installed properly or the board will not fit in your computer or will not work (or the battery will go dead quickly). The black traces on the solderr side are resistors. They are your static protection. Keep in mind that you will be handling a "Live" board when you are done. These resistors are an aid to static prrotection, but they won't save the device from a 20,000 Volt static touch from your finger!! Use caution and good sense in handling ALL semiconductor devices.

Tools You Will Need.

You must have a grounded (3 prong Plug) soldering iron 20 to 25 watts.

Solder (60/40 tin/lead rosin core .031" width) wire..

Solder wick, or better yet, a solder sucker (just in case).

Large alligator clip.

A small file or emery board

The patience of a saint.

Board Construction

(If you have any concerns, call me at 301 730 7187 (evenings 7 to 10 est.) and ask questions.

Verify that you have all of the parts as follows:

1 -- 74LS122	2 -- 28 pin sockets	1 -- 16 pin socket
1 -- 74LS139(National Semiconductor or Fairchild only)		
1 -- Battery Holder	1 -- BR2325 Lithium 3V	
1 -- 1N4001 Diode (or equivalent)		1 -- 1N5818 Diode
1 -- 1N4148 Diode (or equivalent small signal diode)		
2 -- Small slide switches	1 -- PC board	
1 -- 220 uF cap (big blue or black electrolytic)		
3 -- 102 (1000pF caps)	2 -- 104K (.1uF yellow square caps)	
1 -- 1.8K resistor (brown grey red gold)		
1 -- 100K resistor (brown black yellow gold)		
1 -- 2N2222 transistor (or equivalent NPN)		
1 -- Flat brown 4 pin chip capacitor		

Optional Parts:

1 -- 4.7K resistor (required for 64K or more board)
62256LP-12 Static Ram
6264LP-15 Static Ram
1 -- 1N4148 diode (required for 128K board)
8" jumper wire (required for 128K board)
2 -- 2 pin header jumpers (required for boards less than 32K)

Ok, Let's do it!

1. The first component to be mounted is the 74LS122. It is mounted into the 14 pin dip holes next to the gold traces on the top right side of the board. Locate pin one. Pin one is located at the end with the notch in it. (See the adjacent figure.)

If you hold the board up so the gold traces are pointing up and the keyway slot is on the left, then you are looking at the component side of the board and pin one for all chips will point left.

The direction conventions in this document will refer to "up" as being the end with the gold edge traces.

Insert the LS122 in its holes. DO NOT socket this chip or it won't fit in your 2068!! Solder it in.

2. Prepare the battery holder for mounting. Cut the three small black standoffs off flush with the bottom of the holder. This must fit absolutely flush with the PC board or it won't fit in your 2068. Take the file or sandpaper and "erase" the writing on the bottom of the socket. Just grind it off. File around the battery post to reduce the size of the "humps" around the posts. Now fit it to the board. (Push hard.) Look between the holder and the board. Can you see daylight? Grind more off. Mount the battery holder with the Plus (+) pin (square end) pointing up at about the 10 o'clock position. Use the alligator clip to hold the holder in position, turn the board over and solder the battery terminals in. Hint: Use lots of solder and lots of heat. Be sure it still fits flush.
3. Now insert the 28 pin sockets in the board with the white dot facing left. Solder them in.
4. Locate the flat 4 pin brown chip cap. This will mount under the 74LS139 socket. It is non-directional, so don't worry about which way to insert it. Locate the 16 pin dip holes on the left side of the board. Insert the chip cap so that the pins go into the 4 corner pin holes of the 139. Insert the 16 pin socket on top of the chip cap (pin one left). Solder them in.

That's all of the big parts. Now comes the fun.

5. Locate the 2 large power diodes, the 1N4001 (or 1N4004) and the 1N5818. There is a large Diode symbol on the board just above the 139 and left of the top 28 pin socket. The line on the boards' diode symbol and the band on the power diodes are the same. The smaller 1N4004 is for the 5 Volts and the larger 1N5818 Schottky diode is for the battery. Do not mix them up. The Schottky diode is inserted in the large holes closest to the battery holder. The 1N4001 Silicon diode is inserted closest to the 16 pin socket. The white bands must face right.
6. Locate the 1.8K resistor. This part is mounted in the 2 holes directly below the LS122 on the upper right side of the board. Mount it horizontal and flat against the board.
7. Take the 100K resistor and mount it just below the 1.8K.
8. Insert the transistor (2N2222 or equivalent that has an Hfe of at least 150) with the flat side up into the three triangular holes just right of and slightly below the 100K Ohm resistor. Leave the transistor up about a quarter of an inch and solder it in. You will have to bend it back down to the board to have clearance in the 2068 dock connector.
9. Find the three small brown capacitors (they are marked 102, or 0.001 microfarads). These are used for both bypass and timing purposes (See Theory for more information). Place one of these capacitors in the two holes just left of the 74LS122. The second one goes in the two vertical holes just right of the battery holder. The third cap goes in the two diagonal holes just under the transistor.

10. Bend the third cap up towards the 100K resistor. Bend the transistor down to the board. Be sure the cap and left transistor leg do not touch. It is a close fit. If they do, just bend the transistor leg over to the right a little.
11. Locate the large 220 microfarad cap. Locate the letters DK on the Lower left side of the board. Observe the polarity on the cap. The positive side has the long lead. Insert the cap in the two holes just right of the DK letters with the minus side down. You will find that the cap will fit all the way down to the PC board. the 28 pin socket is in the way. It will be necessary to push the cap to the left just enough so that it clears the 28 pin socket. Solder it in place.
12. Locate the square 0.1 microfarad bypass caps. They are marked 104 and either dark brown or yellow. One of the caps goes just below the 220 microfarad cap and the other goes in the two holes just below the 100K resistor, just right of the battery holder. Solder them in.

Now you have to check your connections and solder joints and get out your alcohol to clean up the board. You can use a Q-tip to rub the solder rosin away from the joints. Look for any dull or incomplete joints and touch up all suspect joints. If you have enough alcohol you can drop the board in a container full for about 5 minutes. Take the board out, change the alcohol and put the board in for another minute or so.

Notice that we have not put on the switches yet. We haven't, because the alcohol will degrease the switches and they will fail by sticking or oxidizing (rusting) in a month or so.

Now put the switches on. It may be necessary to file down the switch pins until they fit through their holes. Solder them in.

You are done if you are only using one 32K chip in the top socket. You may continue on to test the board if you so desire.

EXTENDING THE 32K NVM BOARD TO 64K

In order to use the board as either 32K in the top of the dock and 32K in the top of the Exrom banks, or as 64K in the dock, you must add two parts. These are a 1N4148 switching diode and a 4.7K resistor.

The glass 1N4148 diode goes in the rightmost holes between the transistor and the 32K chip socket with the anode up (line on the bottom. Solder it in.

The 4.7K Ohm resistor is the only component that goes on the bottom of the board. Turn the board over (gold traces up still) and locate the switches. The resistor must be mounted between the middle pin of the top switch and the left pin of the bottom switch. Solder it in.

You may now use the board in the top half of the Exrom bank by plugging a 32K static ram chip into the bottom 28 pin socket.